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THE CERTIFICATION PLAN

"The Certification Plan, Its Significance, Scope, and Application to Selected Federal Specifications and Commercial Standards," designated as Letter Circular LC559, dated July 6, 1939, is now available for distribution. The Certification Plan consists in the preparation of lists of "willing-to-certify sources of supply." These are lists of manufacturers who have expressed their desire to supply material on contracts based on certain selected Federal specifications, and their willingness to certify to the purchaser, *upon request*, at the time of placing the contract, that the material thus supplied is guaranteed to comply with the requirements and tests of the indicated specifications. These lists have been compiled by G. W. Wray of the Bureau's Codes and Specifications Division for distribution to tax-supported purchasing agencies.

The earlier lists of willing-to-certify sources of supply designated as Bureau of Standards Letter Circular LC256 and LC256a (a revision of LC256), and their supplements Nos. 1 and 2 are out of print, and copies thereof are no longer available. These lists have been superseded by the "Part" listed below, which, in addition to containing new lists of willing-to-certify firms in certain designated groups, include revisions of the earlier lists in these groups:

[1] Published with approval of the Director of the Budget.

166965—39

Part	Date	Products
1B	Nov. 1, 1937	Animal products, cable and wire, drugs and medicines, dry goods and notions, electric apparatus, instruments, lumber products, metal products, petroleum and products, rubber and rubber goods, vegetable products, and wood products.
2	Dec. 1, 1937	Paints, pigments, varnishes, and products (including linseed oil and turpentine).
3A	Aug. 1, 1938	Hardwood and softwood lumber and timber manufacturers, wholesalers, and retailers.
4A	Sept. 1, 1938	Brooms and brushes.
5A	Mar. 1, 1938	Chemicals, cleaning and polishing materials.
6	June 1, 1936	Coal and products, coal tar and products, and insulating materials.
7A	Apr. 1, 1939	Ceramics, furniture, glass and glassware, and hardware.
8A	July 1, 1939	Office paste, leather, stamp pads, inks, paper and products, rubber and rubber goods, mucilage, and sealing wax.
9	July 1, 1936	Instruments, machinery, pipe, pipe fittings, plumbing fixtures, tubes and tubing (metallic), scales, and tools.
10	July 1, 1936	Minerals and products (including asphalt, brick, cement, gypsum, lime, plaster, refractories, roofing, tile, etc.).
11	Being revised	Metals and metal products
12	Being revised	Cordage and textiles.

Further information concerning the application of the Certification Plan or any other phase of the work on standardization, including the labeling plan, may be obtained from the Division of Codes and Specifications, National Bureau of Standards, Washington, D. C.

PROPOSED STANDARD SIZES OF CANS FOR FRUITS AND VEGETABLES

There has been submitted to the canners, can manufacturers, distributors, consumers, and others interested, a proposed revision of Simplified Practice Recommendation R155–37, Cans for Fruits and Vegetables.

This simplification project is unique in that the revision of R155–37 was drawn up in terms intended to conform with the broad intent of proposed national legislation first set forth in a bill (H. R. 6964) introduced in the House of Representatives in 1937 by Hon. Harry Sauthoff, "to fix standards of dimension and capacity for metal containers for canned fruits, vegetables, and canned milk in order to prevent fraud and deception. . . ."

In June 1937, following an address before the National Conference on Weights and Measures by Mr. Sauthoff, this bill, which was designed to effect a mandatory standardization of can sizes, was endorsed by formal resolution of that Conference. In June 1939 the Conference also adopted a report of its special committee on package standardization which recommended that "Federal legislation be initiated standardizing the quantities of all commodities sold in packages or containers of any kind," and including certain detailed recommendations providing for standardization in fixed sizes based on liquid measure, and on avoirdupois weight, and requiring self-differentiation between sizes.

On March 24, 1938, following formal hearing on H. R. 6964 by the Committee on Coinage, Weights, and Measures of the House of Representatives to which it had been submitted, Hon. Andrew L. Somers, chairman of that committee, suggested to the National Canners Association that the canning industry should secure for its own information, and for the information of the committee, data showing not only the number of can sizes used for each of the industry's products, but also the amount of the respective products canned in each of the sizes now used. In his communication to the Association, the chairman said:

"Because the industry has been working with the National Bureau of Standards in a can size simplification program, the necessary information can best be collected, I believe, in collaboration with that Bureau. If this Committee can be of any assistance in the collection of the desired information we shall be glad to give it. As I stated at the close of the hearing, I am keeping these hearings open, and the Committee will keep the matter under advisement. We shall be glad to follow what is being done by the industry in its work with the Bureau of Standards."

When the survey was completed in May 1939, the results thereof were brought to the attention of Chairman Somers, of the House Committee on

Coinage, Weights, and Measures, to which had been referred H. R. 4402 introduced by Hon. Andrew L. Somers, representing a virtual reintroduction of H. R. 6964. On July 1, 1939, after consultation with Chairman Somers as to the exact wording of the communication to "All concerned with the Manufacture, Distribution, and Use of Cans for Fruits and Vegetables," the list of recommended sizes of cans was submitted for formal approval by those interested therein.

The revised recommendations were drafted by the Container Simplification Committee of the National Canners Association in recognition of the need of preventing consumer confusion and deception. In designating the cans recommended for use, the controlling factor was set forth as the volume of net contents or volume fill.

Recommended by canners for adoption by the industry as standards in packing fruits and vegetables are 44 sizes of cans of specified dimensions. Of these cans, 23 are of special dimensions recommended for use exclusively with individual commodities; namely, asparagus, baby food, corn on the cob, cranberries, mushrooms, olives, pimientos, pineapples, and tomato sauce. The other 21 cans are recommended for use with from 2 to 56 different designated commodities. Certain of the can sizes are recommended for use with each of the 33 classifications of vegetables and 24 classifications of fruits, there being never less than 2 nor more than 10 cans recommended for any one classification.

It is understood that the use of the standard sizes of cans for the respective commodities listed in the revised recommendation, if and when approved, will be made effective during the current season, except in instances of outstanding sales contracts for any of these commodities requiring can sizes not included in the recommended list, and except in cases where nonrecommended sizes of cans are already in stock. It is expected that the use of the standard sizes of cans will become fully effective for the 1940 canning season.

Beginning July 1, 1940, the revised Food and Drug Act provides that the label on each can shall state the volume of the content. This will help consumers to determine the actual volume content of the various cans of food offered for sale after that date.

When accepted and approved by can manufacturers, canners, distributors of canned products, and consumers for promulgation by the United States Department of Commerce, the revised list of can sizes will set forth concretely the industry's desire for standardization on a voluntary basis. Of special interest to the House Committee on Coinage, Weights, and Measures will be the observed adherence to the revised Simplified Practice Recommendation.

Copies of the proposed revision of R155–37 may be obtained by addressing a request to the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

NINTH PROGRESS REPORT ON INDUSTRIAL USES FOR SILVER

According to the Ninth Progress Report of the American Silver Producers' Research Project, work, which is now being financed for the third and final year, will be chiefly concerned with commercial application of what is already known regarding silver. Previous reports announced that the increased use of silver depends upon a wider appreciation of its properties as a noble metal, and no developments thus far have altered this conclusion.

Since the project is conducted in close cooperation with representative commercial companies, the present policy is to transfer problems to industry as soon as a reasonable surety of return can be shown.

There seems to be no reason to lessen the high esteem in which silver is held as a perfectly safe material in contact with foods. As a matter of fact, it is hoped that some systematic study of silver's place in medicine will be undertaken by those competent in this field.

Many methods for applying silver coatings to containers are now being investigated. Several firms are working on the welding of fine silver sheet to a base-metal backing, and as yet no critical obstacles seem to have been encountered. The chief concern is to discover suitable fields of application and to refer them to the appropriate manufacturer.

Silver-clad base metals, made by rolling duplex ingots, are already in limited use, and it is gratifying to note that as soon as the commercial demand grows a place will be found for them in industry. Studies show that the bond remains perfect, both mechanically and thermally, after great deformation.

Spraying introduces difficulties in the control of coating. Manufacturers of spraying apparatus have been given all information on the subject, and left to capitalize on the advantage of being able to apply a coating in inaccessible places.

It has been found that hot-dipping, curiously enough, does not possess any material advantages and, therefore, other methods can be used more advantageously.

In the field of electroplating, steady progress can be reported in the production of thin nonporous coatings by what may be called standard plating technique, but with special attention to cleanliness and the conditioning of the cathode surface. The pilot plating plant at the Bureau has been duplicated, and this second plant is available for experimental work other than pilot production.

Brush electroplating seems to possess some advantages, so far as character of coating is concerned, but introduces difficulties in mass production.

A systematic study of the possibilities of plating with a jet to circulate the electrolyte has been started. Although it is hoped that this method may solve the problem of porosity of very thin coatings, no results are as yet available.

Chemical reduction together with vaporizing and sputtering represent methods for obtaining exceedingly thin coatings (say two-millionths of an inch) presumably with some pores. This method has proved satisfactory in some cases, as for vacuum flasks.

Vaporization is being studied on the basis of preliminary tests made at the Massachusetts Institute of Technology. This method, which is being tried on test cans, is simple and rapid and apparently adherent coatings are readily made.

Cathodic sputtering has been dropped on account of the long time required to get a coating of appreciable thickness and the apparent lack of any advantages over other methods for our purpose.

In another field, silver contact brushes and rings are being studied according to definite schedule at Rensselaer Polytechnic Institute. The cost of manufacturing brushes is relatively high enough to reduce markedly the price spread on the metal content of silver as compared with copper. The advantages of the silver brushes are the reduction in heat generated and the better equalization of current between brushes in parallel.

Additional work in the field of cold-bonding has been done at Lehigh University to find a way of joining silver surfaces without the use of brazing material. Heating the surfaces to redness within a reasonable time before placing them in contact facilitates the bond. Some practical application may be found for such a method.

Much has been accomplished in the field of fungicides since the last report. It is a well-established fact that ionized silver is toxic to fungal and bacterial pathogens. The spray concentrations required are in most cases too dilute to damage foliage and the costs are easily competitive with bordeaux mixture and the mercurials. Apparently the addition of arsenate of lead as an insecticide creates no interference. At present, practical trials of the work are under way in New York, Maryland, Washington, D. C., Virginia, South Carolina, Georgia, and Florida.

Alloys have given the least return for the work undertaken of any of the fields so far explored. No justification has been found for adding small amounts of silver to some largely used material such as steel or brass. Neither has any large-scale use been found for some silver-rich alloy, and although some attention has been given to reported magnetic properties of some alloys, no conclusion has thus far been reached. Silver-alloy coatings protected by selective anodic oxidation are now being investigated. Excellent welds of silver-plated steel have recently been made at Rensselaer Polytechnic Institute by controlled resistance methods. The Bell Telephone Laboratories has developed some silver-rich tin alloys for contacts, and silver-lead bearings are apparently receiving active attention in the aircraft field.

In silver-poor alloys, the physical properties of a large assortment of ternary alloys are being studied, and it is hoped that electrical conductivity measurements may show that one or more of them is of importance. It is gratifying to note that the Dow Chemical Co. has announced the development of a new wrought alloy containing 5.5 percent of silver with some aluminum, zinc, and manganese.

The tin-silver alloys are receiving increasing attention, and apparently the field for a hardened tin is wider than at first imagined. Several steel companies are experimenting with additions of silver to the tinning pots. It seems probable that the International Tin Research and Development Council will place tin-silver on their active list. Tin foil is much hardened by the addition of 3.5 percent of silver and a thinner bottle-cap lining could be used for mineral waters, etc. Interest is being shown by hospitals and laboratories in silver-bearing tin sheet and pipe for handling sterile or distilled water.

The addition of 0.01 percent of silver to lead storage-battery plates lengthens

the life of positive plates, but while it does not help the negative plates, it would be added to both for manufacturing reasons.

The chief interest in the controversial subject of iron-silver alloys lies in the now published patents covering the campaign, undertaken under the auspices of the Chemical Foundation at the Massachusetts Institute of Technology, for the control of corrosion pitting of stainless steel in salt water. An "effective" addition of several tenths of a percent of silver to "18 and 8" stainless greatly reduces pitting. A general use of this formula would create a demand for a considerable amount of silver and extend its use very appreciably.

PREPARATION OF CRUCIBLES FROM SPECIAL REFRACTORIES

As explained in Technical News Bulletin 266 (June 1939), special refractory materials and crucibles are required for the Bureau's metallurgical researches that involve the melting of high-purity metals at temperatures above 1,500° C. The refractory material, from which the crucible is made, must have a high melting point, must be free from impurities that would contaminate the melt, and must be chemically inert to the molten metal at high temperatures. These requirements are met with varying degrees of success by a limited number of purified refractory oxides and silicates. Crucibles made from these special refractories must be of the proper size and shape, and must be sufficiently strong and resistant to thermal and mechanical shock to withstand the conditions of use. Satisfactory crucibles in the smaller sizes can be prepared by tamping or pressing the refractory into shape, but these methods are not so applicable to the production of perfect crucibles of larger size. In addition, the tamping or pressing methods produce relatively thick-walled crucibles that are not entirely satisfactory because of the consumption of relatively large amounts of refractory material and because the bulk of the crucible limits the size of the melt that can be made in a small furnace.

The preparation of thin-walled, strong, resistant crucibles, for use at high temperatures, by a modified slip-casting process, briefly referred to in TNB266, is described in detail in a paper (RP1236) by J. G. Thompson and W. M. Mallett in the August Journal of Research. The slip-casting process is widely used in the formation of clay ware, and consists in placing the "slip," which is an aqueous suspension of the clay, in a plaster mold which absorbs water from the slip and thereby converts it into a plastic, semi-solid mass which can be removed from the mold, dried, and fired. The successful application of the process depends upon the presence in the clay of sufficient plasticity to impart the necessary strength to the green casting and to hold it together while it is being dried and fired. The special refractories are not naturally plastic, as is clay, but the necessary plasticity can be developed in some of them by fine grinding and treatment with acid.

Crucibles were successfully cast from aqueous slips of alumina, beryllia, thoria, zirconia, and zircon. The crucibles ranged in capacity from 20 to 300 $cm.^3$, with lengths up to 16 cm., and with wall thicknesses between 2 and 4 mm. Solid bricks 5 cm. thick also were made, by a modification of the aqueous slip-casting process. Magnesia could not be cast from an aqueous slip, but successful castings were made from a suspension of magnesia in absolute alcohol.

THE SYSTEM PbO-B_2O_3-SiO_2

Glazes for all types of pottery are considered to be composed of oxides which, for comparison and study, are divided into three groups designated as "basic," "intermediate," and "acid." The alkali and alkaline-earth oxides, such as K_2O, Na_2O, and CaO, and also oxides of lead and of zinc, are most commonly found in the first group; Al_2O_3 and B_2O_3 are typical of the second group; and the third group is represented by SiO_2, the presence of which characterizes ceramic glazes and glasses.

Many combinations of these oxides, in binary and ternary systems, have been the subject of fundamental research with the exception of systems containing PbO. RP1231 by R. F. Geller and E. N. Bunting, which will be published in the August number of the Journal of Research, is the fifth paper in a series covering a systematic investigation of those systems containing PbO which are of interest to the glass and pottery industries.

In the system PbO–B_2O_3–SiO_2, compositions with more than about 35 percent of B_2O_3 are very unstable and combine with moisture from the surrounding air to form, in part, crystals of boric acid. Also, compositions with less than 60 percent of PbO, and especially those with more than about 10 percent of SiO_2, are so viscous that

months are required to reach partial crystallization. Consequently, phase relations were established in only that portion of the system containing over 60 percent of PbO, but it is reasonably certain that nearly all of the remaining portion is occupied by the fields of SiO_2 and of $PbO.2B_2O_3$ and lies mostly under a two-liquid area.

The system has one ternary compound ($5PbO.B_2O_3.SiO_2$) at the liquidus surface. It melts incongruently at 551° C to form $2PbO.SiO_2$ and liquid, is negative in character, and the indices of refraction are 2.04 ±.005 (minimum) and 2.085 ±.005 (maximum). The liquidus of the lowest melting eutectic is at 484° C and 84.5 percent of PbO, 11.0 percent of B_2O_3, and 4.5 percent of SiO_2.

USE OF MINERALIZERS IN MANUFACTURE OF PORTLAND CEMENT CLINKER

In the manufacture of portland cement, a raw mix which will give 8 to 10 percent of $Al_2O_3+Fe_2O_3$ in the clinker is usually chosen, as these two oxides act as fluxes and bring about clinkering and complete combination of the cement compounds at temperatures available in commercial practice. However, in the preparation of sulfate-resistant cements it is desirable to have as low a content of alumina and iron compounds as possible. If the proportion of the fluxing oxides is to be reduced to about 3 percent for this purpose, then a mineralizer or catalyst must be found that will be as effective in promoting the formation of silicates as the 5 to 7 percent of $Al_2O_3+Fe_2O_3$ which has been left out of the raw mix.

Recent studies by E. P. Flint indicate that magnesium fluosilicate ($MgSiF_6$) is such a mineralizer. Added in amounts of only 1 percent before heating, it greatly reduced the uncombined lime and raised the tricalcium silicate content of cement mixtures heated at 1,350° to 1,450° C., and also aided in maintaining dicalcium silicate in the active β-form. Cryolite (Na_3AlF_6) added in corresponding amounts was found to be less effective, and fluorspar (CaF_2) had a considerably lower activity. The addition of boric oxide (B_2O_3) and calcium phosphate ($Ca_3(PO_4)_2$) to the mixtures before heating proved to be detrimental.

Possible uses of magnesium fluosilicate as a mineralizer are (1) in the heating of portland cement mixtures of normal compositions to accelerate the rate of combination of lime and silica and to decrease the length of time and lower the temperature of heating required, giving an increased economy of fuel; (2) in the manufacture of white cements; (3) in the preparation of sulfate-resistant cements to reduce the total amount of Al_2O_3 and Fe_2O_3.

The complete report of this work has been submitted for publication in "Rock Products."

PARTICLE SIZE AND PLASTICITY OF LIME

The importance of plasticity in mortars and plasters is becoming more generally recognized. Hydrated lime is often used as a constituent of mortars and plasters to improve their workability. Limes differ greatly in plasticity (which largely determines their value in mortars and plasters), as has been pointed out in "Differences in Limes as Reflected in Certain Properties of Masonry Mortars," J. Research, NBS **17**, 895 (1936) (RP952). Since but little information is available concerning the relation between plasticity and particle size of hydrated limes, distribution data down to 1 or 2 microns and Emley plasticity values for 25 hydrated limes were recently determined by D. L. Bishop, and the results are reported in the August Journal of Research (RP1232). The geometric weight mean diameters of the dry hydrated limes were found to vary from 2.9 to 7.8 microns. There was no apparent relation between Emley plasticity values and particle-size distribution down to 1 or 2 microns. Hydrated limes may have very similar distributions and yet differ widely in Emley plasticity values. Particle-size measurements were also made on quicklime putties prepared by hydrating quicklimes with an excess of water. Putties prepared in such a manner were very much finer than commercial hydrated limes. There was likewise no correlation between Emley plasticity values and the particle-size distribution of the quicklime putties. Many of the limes having the same calculated specific surface had widely different particle-size distributions. It is possible that the size distribution of the material finer than 2 microns may be the determining factor in the plasticity of limes.

STRUCTURAL PROPERTIES OF "PRE-FAB" WALLS, PARTITIONS, AND FLOORS

In its low-cost housing investigation, the Bureau tested 33 specimens submitted by the Harnischfeger Corpora-

tion. These represented constructions for walls, partitions, and floors marketed under the trade name "Pre-Fab Homes," and consisted of prefabricated panels with welded sheet-steel frames, designed to be erected on masonry foundations and interlocked by special key-and-tapered-pin fastenings.

The wall specimens were subjected to compressive, transverse, concentrated, impact, and racking loads; the partition specimens to impact and concentrated loads; and the floor specimens to transverse, concentrated, and impact loads. The transverse, concentrated, and impact loads were applied to both faces of the wall specimens, thus simulating the actual loads applied to the elements of a house.

For each of the loads three like specimens were tested. The deformation under load and the set after the load was removed were measured for uniform increments of load up to the maximum, except for concentrated loads, for which the set only was determined. The results, presented graphically and in tables, are given in Building Materials and Structures Report BMS18, copies of which are obtainable for 10 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

THERMAL EXPANSION FOR AIRCRAFT

When aircraft carry passengers to high altitudes or otherwise through cold air, comfort requires that the cabins be warmed. Even though heat is supplied, passengers will not be comfortable if the cabin walls are cold. The use of bright metal surfaces will reduce somewhat the discomfort of cold walls. In general, thermal insulation of some sort is needed. The purpose is best served by the minimum practicable amount of some fibrous or other loose material, preferably noncombustible, enclosed between walls at least one of which has a bright metal surface. To avoid the gradual collection of water in the material, the space which contains it should be properly vented to the *outside* of the cabin.

QUANTITATIVE FORMATION OF FURFURAL AND METHYLFURFURAL FROM PENTOSES AND METHYLPENTOSES

The complete conversion of the pentoses and methylpentoses to furfural and methylfurfural is important not only from a fundamental point of view, but also for practical purposes, since it is used as a means of determining the pentosan content of woods, paper pulps, and other organic fibers. The three most commonly encountered pentoses arise from xylan, araban, and rhamnosan. Work on various phases of the problem has been reported over a period of years. Many workers, unable to obtain quantitative yields of the aldehydes from these pentoses, have questioned whether the equation for the conversion actually represents the changes taking place. In the standard methods for pentosan determinations, empirical values are used for the calculations, based upon a yield of 88 percent of furfural from xylose, 74 percent from arabinose, and amounts of methylfurfural from rhamnose, which vary according to the procedure.

A method by which quantitative yields of furfural from xylose may be obtained was reported in J. Research **21**, 327 (1938) RP1132. The procedure consists in distilling the pentose in 12-percent hydrochloric acid saturated with sodium chloride, and rapidly removing the volatile aldehyde with the aid of steam. A paper (RP1233) by E. E. Hughes and S. F. Acree in the August Journal of Research gives the results of the application of this procedure to two other pentoses, arabinose and rhamnose. Under the same conditions of distillation, the rates of formation of furfural or methylfurfural from the pentoses are different. The effects of salts and other reagents upon the rate of formation of the aldehydes, as well as the amounts recovered, were also studied. It was found that if the reactions are carried to completion without subjecting the aldehydes to decomposition by high temperatures and the action of strong acid vapors, theoretical yields of furfural and methylfurfural may be obtained from the pentoses.

ACRYLIC RESINS AS DENTURE BASE MATERIAL

Tests on the curing, "shelf life," color stability, strength, hardness, and dimensional changes on curing were made on three acrylic resins (Crystolex, Lucitone, and Vernonite) furnished the dental profession for use as denture base materials. In comparison with hard rubber, they have satisfactory mechanical properties and are superior in color stability. The shelf life of the two resins furnished in a plastic cake was short at room temperature, while the resin (Crystolex) furnished in powder and liquid was satisfactory in this respect. Observations on dentures in service showed that phenol-

formaldehyde resins (Aldenol, Duratone, Luxene) warped and were not color-stable, while an acrylic resin (Vernonite) was color-stable and showed less warpage. When all factors are considered, such acrylic resins as were tested appear to be the most satisfactory plastics currently used for denture bases.

INFLUENCE OF NATURAL NONTANNINS ON DETERIORATION OF LEATHER

Leathers may be divided into two groups according to the length of time they are expected to give useful service. One group comprises leathers having a useful life of only a few years; for example, those used for shoes, belting, straps, bags, and miscellaneous articles. Possibly 90 percent of the leather made comes within this classification. The other group consists of leathers expected to last for a much longer time, such as those used for upholstery and bookbinding. Indeed, the owner of a valuable book bound in leather hopes that the binding will endure indefinitely. It is generally recognized that one cause of the failure of leather bindings is the destructive action of sulfur gases in the surrounding atmosphere. Methods for protecting leather in service so as to increase its life have, therefore, received considerable attention.

It has been demonstrated by Innes, of the British Leather Manufacturers' Research Association, in London, that the nontannins found in vegetable tanning materials act as protective agents. His conclusion was based on laboratory examinations of various old leathers which were in different stages of deterioration, and also on the results of tests on new leathers to which natural nontannins were added. The behavior of these samples was observed after treatment with sulfuric acid and hydrogen peroxide. Samples containing nontannins were less affected by the treatment. Frey and Beebe, of the United States Department of Agriculture, came to the same conclusion. They exposed leathers in a chamber to the combustion products of illuminating gas.

The effects of acids on leather have been studied at the Bureau for many years, and it has been established that new leather will not deteriorate because of initial acidity if the pH value of the leather is above 3. This criterion is considered sufficient for judging this property of the first-mentioned group of leathers. R. C. Bowker and R. B. Hobbs then decided to determine, if possible, whether the addition of natural nontannins would have any influence on the effective acidity, as indicated by pH values, at which leather starts to deteriorate. Chestnut and ordinary quebracho-tanned leathers were prepared for this work in the Bureau's experimental tannery. One portion of these leathers was treated with chestnut extract and another portion with ordinary quebracho extract. By these treatments both tannins and nontannins were added to the leathers. Each group of samples was treated with sulfuric acid to secure a series having pH values ranging from that of the original leather to about 2.3.

The leathers were tested for initial strength, aged for 2 years, and again tested for strength. The change in strength on aging was taken as a measure of deterioration. The results show that the addition of small amounts of natural nontannins—about 0.5 to 2.6 percent—and the addition of about 6 percent of tannins did not influence the initial acidity at which these leathers start to deteriorate. Serious deterioration started at or near pH 3, as was the case in many previous studies on vegetable-tanned leathers.

ELECTROPHORESES OF COLLAGEN

The white fibrous connective tissues of skin, tendon, and bone are classed as collagen, but there is some doubt as to whether they are identical substances. A paper (RP1230) by John Beek, Jr., and A. M. Sookne in the August Journal of Research reports the results of measurements of the electrophoresis of purified preparations of these materials. It was found that the differences in electrophoretic mobility which appeared in the less acid solutions were related to changes which took place in the processes of purification. The bone collagen and one sample of hide collagen were subjected to prolonged treatment with solutions which were strongly acid and alkaline, respectively. This treatment resulted in a modification of the protein which produced a marked increase in the acid character of these two preparations. The mobilities of all the preparations are about the same in the more-acid solutions.

ELECTROPHORETIC STUDIES OF SILK

Natural silk as it is produced by the silkworm consists of two protein substances, namely, silk fibroin, which is

the fiber utilized in textile materials; and silk sericin, a gumlike substance, which acts as a protective coating on the fiber during weaving or knitting but which is removed in the finished material. Because of the differences in chemical and physical properties of the two substances, the complete or uniform removal of sericin from fibroin is of considerable importance. For example, uneven distribution of residual sericin on silk would undoubtedly result in uneven dyeing of the fibers. Since ordinary chemical methods are inadequate for determining the extent of removal of sericin from silk fibers, A. M. Sookne and Milton Harris have employed a micro-electrophoretic technique. In addition, this approach was used to determine the properties of fibroin in the presence of different ions and also in different states of aggregation.

As set forth in the Journal of Research for August (RP1231), fibroin and sericin were determined, and the extent of removal of the latter during degumming by the soap and enzyme methods was acertained. The data suggested that sericin contains a much greater proportion of reactive groups than fibroin and indicate the importance of obtaining either uniform or complete removal of sericin during degumming processes.

The isoelectric points are shown to vary slightly with ionic strength. In acetate buffers of 0.02 *M* ionic strength, the isoelectric point of fibroin is 3.6 and that of sericin 4.3.

Large ions of complex structure, such as phthalate or picrate, appear to have specific effects which are readily detectable by the electrophoretic technique.

Dissolved fibroin adsorbed on glass particles and fibroin regenerated from similar solutions had the same isoelectric points but different pH-mobility curves. Fibroin regenerated after dissolving in solutions of lithium bromide gave the same pH-mobility curve as untreated fibroin.

THE ASSIGNMENT OF UNCERTAINTIES TO THE DATA OF CHEMISTRY AND PHYSICS, WITH SPECIFIC RECOMMENDATIONS FOR THERMOCHEMISTRY

In order that the results of measurements made in different laboratories may be compared and appraised for the purpose of estimating the uncertainty to be attached to the value of a given physical or chemical constant, it is desirable that experimenters adopt a uniform procedure for expressing the consistency of their data. In a paper submitted for publication in Chemical Reviews, F. D. Rossini and W. E. Deming present some discussion along these lines and offer specific recommendations in connection with the data of thermochemistry. The following subjects are discussed: The standard deviation and the theory of probability; the propagation and combination of errors; application of the theory to measurements in general; and specific recommendations for thermochemistry.

APPROXIMATION TO A FUNCTION OF ONE VARIABLE FROM A SET OF ITS MEAN VALUES

Many quantities measured by engineers and physicists have values depending on position in time or space. Frequently the method of measurement is such that only the average values, over intervals of time or space, of the quantity, are obtained. A paper by Martin Greenspan (RP1235) in the August Journal of Research presents formulas by means of which the values of the measured quantities at a definite point in time or space may be approximated.

These formulas have been applied at the Bureau to the problem of the distribution of strain in circular flat plates subjected to hydrostatic pressure.

CORRELATION BETWEEN IONIZATION IN THE IONOSPHERE AND SUNSPOT NUMBERS

Recent work by F. L. Mohler has shown a close correlation between ionization in the ionosphere and sunspot numbers, the effect being greatest for the F_2 layer. Ionization of the F_2 layer is believed to come from solar radiation of wave length less than 910 A for which the solar atmosphere is very opaque. It is shown that most of the radiation must come from bright flocculi on the sun rather than from the disk as a whole and that this can explain the observed correlation.

METHOD FOR SEALING PLATINUM TO PYREX GLASS

Two corrections should be made in the article on this subject on page 64 of Technical News Bulletin 267 (July 1939). The first sentence of the second paragraph should read: The general problem of joining metals and

glasses has been studied by many investigators, but the fact that the thermal expansions of platinum and Pyrex glass are so different has always caused trouble. The fourth sentence of this paragraph should read: If the walls of the tube are thin as compared with its diameter. . . .

NEW AND REVISED PUBLICATIONS ISSUED DURING JULY 1939

Journal of Research [2]

Journal of Research of the National Bureau of Standards, volume 23, number 1, July 1939 (RP1218 to RP1227, inclusive). Price 30 cents. Annual subscription, 12 issues, $3.50.

Research Papers [2]

[Reprint from May 1939 Journal of Research]

RP1208. Torque between concentric single-layer coils. Chester Snow. Price 5 cents.

Building Materials and Structures [2]

[Persons who wish to be notified of new publications in the "Building Materials and Structures" series as soon as they are available should write to the Superintendent of Documents, Government Printing Office, Washington, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.]

During the past month the following publication in this series has been issued:

BMS18. Structural properties of "Pre-Fab" constructions for walls, partitions, and floors sponsored by the Harnischfeger Corporation. H. L. Whittemore, A. H. Stang, and V. B. Phelan. Price 10 cents.

Simplified Practice Recommendation [2]

R93–39. Paper shipping tags. (Supersedes R93–29). Price 5 cents.

[2] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $3.50 per year (United States and its possessions, and Canada, Colombia, Cuba, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Newfoundland (including Labrador), Panama, and Venezuela); other countries, 70 cents and $4.50, respectively.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC556. Automotive brake lining.

LC557. List of commercial standards. (Supersedes LC354.)

LC558. Dental materials: Publications by the staff of the National Bureau of Standards and research associates on dental materials.

LC559. The certification plan: Its significance, scope, and application to selected Federal Specifications and Commercial Standards.

LC560. List of weights and measures offices of the States and District of Columbia.

RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS [3]

Specifications of uniform color tolerances for textiles. D. B. Judd. Textile Research (65 Franklin St., Boston, Mass.), **9**, 292 (1939).

Sources of ultraviolet and infra-red radiation used in therapy. W. W. Coblentz. Reprint from Handbook of Physical Therapy (Am. Medical Assn., 535 North Dearborn St., Chicago, Ill.) (1939).

Experimental tannery at the National Bureau of Standards. R. C. Bowker. Hide and Leather and Shoes (300 West Adams St., Chicago, Ill.) **97,** No. 23, 11 (June 10, 1939).

Plastics as structural materials for aircraft. G. M. Kline. Commercial Aviation (341 Church St., Toronto, Canada) **1,** no. 3, 19 (May, 1939), and No. 4, 21 (June, 1939).

[3] These publications are not obtainable from the Government. Requests should be sent direct to publishers.

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